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The Economics of the Sunflower:  
An Example of the Dynamics of Comparative Advantage

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THE ECONOMICS OF THE SUNFLOWER:  
AN EXAMPLE OF THE DYNAMICS OF COMPARATIVE ADVANTAGE\*

by

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I appreciate the opportunity to discuss the economics of the sunflower with you. There is probably no more dynamic sector of the agriculture of the Upper Midwest. There is also no more interesting example of the interactions among technological improvements, government policies, and the changing comparative advantage a particular region might possess.

Rather than give you a short-term market outlook for the sunflower, I would like to take a longer-term perspective and discuss what might be the future of the sunflower in the decade ahead. Although inherently more difficult to do, because of the difficulty of predicting into the future, the longer-term perspective is likely to be more useful to you, since it may influence your longer-term production and marketing plans.

I would like to divide my comments into three parts: (1) a brief review of the recent development of this sector in the United States; (2) a brief discussion of some of the factors behind recent developments; and (3) a look to the future. At the end I will have some concluding comments.

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### Past Development of the Industry

It is only since 1966 that oilseed sunflower has become a crop of economic significance in the United States. In 1966 total acreage is estimated to have been a mere 6,000 acres. Last year - 1979 - total acreage reached a record breaking 5.5 million acres. The bulk of the increase in production has taken place since the 1976/77 crop year.

This year production has declined rather substantially, some 20-25 percent. The decline this year is a response to the large crop of last year, which coincided with a very large crop of soybeans world-wide, and was a logical reaction to the resulting low prices for last year's crop. It also raises the question of what the future of the industry might be. It is worth noting, however, that in 1979 the acres planted to sunflowers exceeded that for peanuts, rice, and tobacco combined.

Production of this crop is highly concentrated in the U.S. Over 90 percent of the total crop is grown in North Dakota, South Dakota, and Minnesota, mostly in an area where soybeans are at or near their northern extremity for economical production. North Dakota alone accounts for about 60 percent of the U.S. total. The only other state aside from these three with a significant production is Texas.

Yields for sunflowers have been rather unstable. The average for the 1967-69 crops was 1,077 pounds per acre. For the 1974-76 period, however, they were down to an average of 974 pounds per acre. Nineteen hundred seventy-seven was the year that most producers shifted from the old open-pollinated oilseed sunflower to hybrids. Acreage more than doubled that year compared to the previous year, and production more than tripled. Average yields increased from 974 pounds per acre in 1976 to 1,242

pounds in 1977. After declining somewhat in 1978, the national average yield was a new record of 1,350 pounds per acre in 1979.

Data on yields are difficult to interpret because of the unstable weather conditions in the area where most of the sunflowers are grown and the huge increase in area planted. It seems clear, however, that the new hybrid varieties have substantially raised the production potential of this crop in this country.

Sunflowers are used for oil, for confectionary uses, and for bird seed. Their greatest potential appears to lie as an oilseed, however, and the rapid expansion of the recent past has been for this purpose. The greatest potential in the future also appears to be in this direction, and most of my comments view its potential in that context.

Sunflower meal has potential in the domestic livestock feed market. Without dehulling, sunflower seed yields a 28-percent protein meal. A 44-percent protein meal can be manufactured by partially dehulling the seeds before extracting the oil. Further screening of the meal raises the protein content to 51 percent. Soybean meal, in contrast, is either 44 or 49 percent protein, depending on whether or not it is dehulled. The only disadvantage sunflower meal has compared to soybean meal is its high fiber content, and this can be remedied through dehulling.

Sunflowers are the second most important source of vegetable oil in the world, second only to soybeans. It is a premium quality oil, and competes mainly with corn and safflower oil. Sunflower oil has only recently entered the U.S. retail vegetable oil market, where it is marketed as a cooking oil - both pure and combined with soybean oil - and in margarine.

The export market has so far been the lifeblood of the sunflower industry. Sunflower oil is the preferred salad and cooking oil in Europe, and Western Europe is by far the largest market for U.S. sunflower, taking nearly 90 percent of all U.S. sunflower seed exports. West Germany and the Netherlands, alone, account for nearly 70 percent of the total. Most of the exports to Western Europe are shipped as seed, which European processors then crush for oil and meal. Mexico is another importer of sunflower seed, as is Japan. Both countries prefer to do their own crushing.

Venezuela has been the largest market for U.S. exports of sunflower oil, and last year accounted for half the U.S. export total. Argentina is the most important competitor of the U.S. for the Venezuelan oil market and even last year supplied four-fifths of their total imports.

Marketing institutions and support facilities are rapidly emerging to facilitate the expansion of the sunflower industry. Crushing capacity is growing rapidly in this country, and is expected to rise from about 1 million tons this year to 2.6 million tons next year. Five new mills are expected for North Dakota alone.

The Minneapolis Grain Exchange provided an additional marketing tool earlier this year by establishing a market for sunflower futures contracts. Trade is in units of 100,000 pounds, No. 1 U.S. origin. Trading volume has grown rapidly, and the Chicago Board of Trade is now seeking regulatory approval for a competing sunflower futures market. This institutional development provides a means of hedging for those participating in the industry, and hence a formal, efficient means of transferring risk and uncertainty to others if participants in the market so desire.

What Is Behind This Rapid Expansion  
of the Industry?

The production of sunflowers in the United States is not new, nor is it a new crop on the world scene. Back during World War II some U.S. farmers grew oilseed sunflower on a limited basis. This was in response to the country's need for vegetable oil at that time. The seed oil content of sunflowers was too low at that time for it to compete with other U.S. crops, however, so after the war sunflower returned to being primarily an ornamental crop grown for birdfeed and snacks.

Plant breeders in the Soviet Union, however, succeeded in pushing the oil content of sunflower seed from 30 up to 40 percent. As a result, the Russians began to cultivate oilseed sunflowers extensively. U.S. farmers began to grow Soviet-developed open-pollinated sunflower in 1966, but it wasn't until the latter half of the 1970's that sunflower production really took off in this country.

The basis for the successive "take-offs" - one in 1966 and the other in the late 1970's - appears to be a couple of unusual events, one of which involved a shock to producers and processors, and the other of which involved a technological breakthrough which raised productivity by a substantial margin. These various forces and the particular sequence in which they occurred produced both a learning situation and the opportunity for an important new source of income for producers.

The original impetus for sunflowers in the mid-1960's was prompted, in part, by the emergence of latex-based paint. The new paint undermined the market for linseed oil made from flax. U.S. flax processors were

therefore on the lookout for an oilseed crop that would keep their crushing equipment running full capacity. Speculating that oil seed sunflower might be the answer, Cargill sent an oil seed chemist, Richard Baldwin, to the Soviet Union in 1966.

Baldwin brought back some seeds of a new variety which had a relatively short growing season and was frost, flood, and drought resistant. The Soviets had previously released seeds of an earlier variety to the Canadian Department of Agriculture. This variety had already proved adaptable to a dry, northern climate and was tested by seed companies and the USDA. Early in 1969, a Romanian scientist developed the first hand-pollinated sunflower oil seed. This seed was brought to the U.S. in 1972 by the Farmers Union Grain Terminal Association, and this foundation breeding seed eventually led to the hybridization of the crop.

Researchers had been experimenting with hybrids for some time. The major breakthrough came with the discovery of the male-sterile side,<sup>1/</sup> which is planted with a later-discovered fertility restorer (R) line. In 1973, after 12 years of research, Dahlgren and Co., here of Crookston, developed one of the first hybrids that produced uniform plants and more sunflower heads than open-pollinated varieties. In 1974, the USDA, in cooperation with a number of seed growers, developed a seed that increased yields by 20 percent. That seed proved financially attractive to producers. Since then, hybrids have been further improved so that yields are higher, oil content greater, and plants nearly disease-free. These developments

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<sup>1/</sup> Cytoplasmic male-sterility is the technical terminology used. It is this male sterility which is critical to the development of hybrids.

coupled with more effective weed control procedures, have improved the profitability picture for sunflowers.

In summary, then, the basis of the rapid expansion of the crop was the availability of improved varieties that made the crop a great deal more profitable for producers. The original impetus for the search for this new crop, however, was the emergence of a latex-based paint, which reduced the market for linseed oil from flax. Farmers needed a new crop, and so did processors who had made substantial prior investments in crushing capacity. The availability of a flexible and responsive marketing system which would put the products of the new crop rapidly into existing markets helped facilitate the expansion of sunflowers as a viable crop and helped bring it to its present status.

#### What Will the Future Bring?

The longer-term outlook for sunflowers in the U.S., and especially in the Upper Midwest, is in my view excellent. The potential in the domestic market is quite great. The export potential may be even greater. Technological developments have been the key to expansion in the past. It may well be, however, that policy measures in this country as well as elsewhere may be the dominant force in determining how the industry develops in the future. Moreover, some of these policy measures lie well outside the narrow field of agriculture and agricultural trade.

Let me organize my analysis for the future under the familiar topics of demand and supply, and then consider some of the relevant trade issues.



### The Supply Side

The Tri-State area of North Dakota, South Dakota and Minnesota may well have a comparative advantage in the production of sunflowers. Understanding this comparative advantage is the key to understanding the role of sunflowers in this particular region.

Other areas of the country may be able to obtain higher yields for sunflowers than Minnesota and the Dakotas. However, that isn't the whole story on comparative advantage. It is the relative yields or net income compared to other crops or economic activities that matters. Hence, it is the fact that sunflowers do better in a relative sense in this region that matters. Given the climatic conditions and soil endowment, sunflowers appear to out-compete crops such as soybeans, wheat, and corn in regions where they are now grown. That situation can expect to continue.

The key to maintaining that position, however, will be to sustain the increases in productivity we have observed in the past. This productivity and efficiency has a number of different dimensions. The obvious one is to have a continuous flow of improved, resistant varieties. But innovations in the full range of production practices are required, as is continued improvement in the management of the total farm enterprise, with particular emphasis on the relationship of sunflower to other enterprises on the farm. Sustaining this efficiency and productivity growth on the production side requires continuous research by the public and private sector, and the usual experimentation and innovation that farmers do in the normal course of their activities.

Producing the crop efficiently is not the whole story, however. The output also has to get to the eventual consumer in an efficient manner. That

means that the marketing and processing system is also important, where marketing includes the entire transportation and port system. Large steps have been taken in developing an efficient marketing and processing system. However, I suspect that a great deal can yet be done to expand the market and to develop more efficient processing and marketing networks.

This takes us to the demand side of the market.

### The Demand Side

The demand side of the market appears to be particularly promising. A number of factors favor sunflower, and especially sunflower from this region.

First, sunflower provides a high quality oil. As per capita incomes rise, one can expect the demand for high quality products such as this to increase. My notion is that this nation is now positioned to undertake another sustained period of economic growth. Per capita incomes have been stagnant for about a decade. During that period we have undertaken some major economic adjustments, largely oriented toward making our economy more export-oriented and dealing with environmental problems. A good part of those adjustments is now behind us, and we are beginning to recognize once again the importance of productivity. If we follow through on measures to revitalize our economy, we will see our per capita incomes start to rise again.

We can expect per capita incomes to rise in other countries as well, and especially in some of the less-developed countries. India has now become a major importer of vegetable oils. As its per capita income rises, we can expect that demand to increase. Other middle-income countries such

as Brazil and Mexico may well become important importers of vegetable oils.

Interestingly enough, other developments associated with the energy crisis may also act to increase the demand for sunflower oil. For example, this nation has committed itself to a program of massive subsidies for the production of gasohol from biomass. If carried through to fruition, this program may utilize up to 100 million tons of corn. The demand for corn as a feedgrain is already expected to be strong. Hence, we can expect the relative price of corn to rise. This will probably cause a great deal of land to be shifted out of soybeans and into corn. The reduction in supply of soybeans will increase the demand for vegetable oils from other sources.

This kind of development is likely to take place in other countries as well. Brazil, for example, has committed itself to a massive program of gasohol - a program more ambitious than our own. Until recently that program has been based on sugarcane. Now policymakers are urging Brazilian farmers to shift out of soybeans into the production of corn for use in the production of gasohol. Brazilian soybean oil has been consumed mostly in the domestic market. If farmers do shift out of soybeans, Brazil may well find itself in the vegetable oil market, shifting from the import of petroleum to the import of vegetable oils.

#### Trade Issues

Two sets of trade issues are important. First, the potential for substantial exports of vegetable oils as well as unprocessed sunflowers is quite great. But to realize that potential, the U.S. has to help maintain a relatively open international trading system, in addition to sustaining its own growth of productivity. The key to maintaining an open trading

system is to resist some of the protectionist sentiments that are rampant in this country. If other countries cannot export to us, they certainly are not going to import from us. Agriculture has a vital interest in avoiding protective measures for our domestic economy. We need to speak out more frequently on this important issue.

The second set of issues has to do with the value of the dollar, or the exchange value of our currency. Two points are relevant here. First, my expectation is that the value of the dollar will rise into the foreseeable future, barring a major war or a disaster in the Middle East. A rise in the value of the dollar will make our exports less competitive in international markets, other things being equal. We will need to have substantial improvements in productivity and efficiency to offset the effect of this increase in the value of our currency.

Second, with the system of flexible exchange rates and a well-integrated international capital market, the stop-and-go monetary policies of the last decade impose rather large shocks on the agricultural sector. This has been in my view an important source of the instability agriculture has faced this last decade.

There is some expectation that the economic team that Reagan is assembling will turn away from such policies. Whether they do or not, or whether they can, remains to be seen. Hence, we may find the foreign demand for sunflowers and sunflower oil to be rather unstable, even though the trend may be strongly upward.

Concluding Comments

The market prospects for sunflowers and sunflower oil appear to be quite promising. An important aspect of that outlook, however, is that developments in other countries, and developments in sectors outside of agriculture, such as our energy policy and our monetary and fiscal policies, are as important in determining that outlook as are factors more narrowly within agriculture. That's the kind of world we now live in. It's a very different world than we lived in a decade ago.

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